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SDG 4 And Open Book Exams: Shaping The Future Of Assessment In Global Education

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Abstract
Open book exams, a shift in assessment practices, align with SDG 4's emphasis on quality education, particularly in promoting inclusive, equitable, and lifelong learning. Open book formats can foster a deeper understanding of concepts, encourage the use of resources, and cater to diverse learning styles, potentially improving educational outcomes.

Key Words: assessment, education, exams, goal, learning, outcome, practice, training

SDG 4 and the Importance of Quality Education:

1. **Ensuring inclusive and equitable quality education:**
   SDG 4 aims to provide equal opportunities for all learners, regardless of gender, wealth, or location.
2. **Promoting lifelong learning**:
   The goal emphasizes the importance of education from early childhood to adulthood, including vocational training and higher education.
3. **Developing relevant skills and knowledge**:
   SDG 4 seeks to equip individuals with the skills and knowledge needed for employment and a sustainable future.

Open Book Exams Can Contribute:

1. **Flexibility and Accessibility**:
   Open book exams can provide more flexible assessment methods, allowing students to leverage resources and explore different approaches to problem-solving.
2. **Deeper Learning:**
   By requiring students to understand and apply concepts rather than rote memorization, open book formats can promote deeper learning.
3. **Diversity and Inclusion:**
   Open book assessments can cater to diverse learning styles, creating a more inclusive environment for all learners.
4. **Resource Utilization:**
   Students can be encouraged to use resources such as textbooks, online databases, or even each other, fostering collaboration and knowledge sharing.
5. **AI-Powered Assessment**:
   AI can be used to analyze student performance and provide personalized feedback, further enhancing the quality of learning and assessment.

Challenges and Considerations:

1. **Maintaining Validity and Reliability:**
   Ensuring the validity and reliability of open book assessments requires careful design and implementation.

2. **Preventing Academic Dishonesty**:
   Measures need to be in place to prevent cheating and ensure academic integrity.
3. **Teacher Training and Support:**
   Educators require training and support to effectively implement and evaluate open book exams.
4. **Technological Infrastructure:**
   Access to technology and reliable internet connectivity is crucial for successful open book assessments.

Shaping the Future of Assessment:
By embracing open book exams and other innovative assessment methods, educators can contribute to the realization of SDG 4 and create a more inclusive, equitable, and effective educational system for all.

Sustainable Development Goals (SDG) are at the forefront of government initiatives across the world. The SDGs are primarily concerned with promoting sustainable growth via ensuring wellbeing, economic growth, environmental legislation, and academic advancement. One of the most prominent goals of the SDG is to provide learners with high-quality education (SDG 4). This paper aims to look at the perspectives of the Sustainable Development Goals improvised to provide quality education. We also analyze the existing state of multiple initiatives implemented by the Indian government in the pathway to achieving objectives of quality education (SDG 4). Additionally, a case study is considered for understanding the association among the observed indicators of SDG4. For this purpose, exploratory data analysis, and numerical association rule mining in combination with QuantMiner genetic algorithm approaches have been applied. The outcomes reveal the presence of a significant degree of association among these parameters pointing out the fact that understanding the impact of one (or more) indicator on other related indicators is critical for achieving SDG 4 goals (or factors). These findings will assist governing bodies in taking preventive measures while modifying existing policies and ensuring the effective enactment of SDG 4 goals, which also will subsequently aid in the resolution of issues related to other SDGs.

Education is fundamental for achieving full human potential, developing an equitable and just society, and promoting national development. Providing universal access to quality education is the key to India’s continued ascent, and leadership on the global stage in terms of economic growth, social justice and equality, scientific advancement, national integration, and cultural preservation. Universal high-quality education is the best way forward for developing and maximizing our country's rich talents and resources for the good of the individual, the society, the country, and the world. India will have the highest population of young people in the world over the next decade, and our ability to provide high-quality educational opportunities to them will determine the future of our country. The global education development agenda reflected in the Goal 4 (SDG4) of the 2030 Agenda for Sustainable Development, adopted by India in 2015 - seeks to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” by 2030. Such a lofty goal will require the entire education system to be reconfigured to support and foster learning, so that all of the critical targets and goals (SDGs) of the 2030 Agenda for Sustainable Development can be achieved.

The world is undergoing rapid changes in the knowledge landscape. With various dramatic scientific and technological advances, such as the rise of big data, machine learning, and artificial intelligence, many unskilled jobs worldwide may be taken over by machines, while the need for a skilled workforce, particularly involving mathematics, computer science, and data science, in conjunction with multidisciplinary abilities across the sciences, social sciences, and humanities, will be increasingly in greater demand. With climate change, increasing pollution, and depleting natural resources, there will be a sizeable shift in how we meet the world's energy, water, food, and sanitation needs, again resulting in the need for new skilled labour, particularly in biology, chemistry, physics, agriculture, climate science, and social science. The growing emergence of epidemics and pandemics will also call for collaborative research in infectious disease management and development of vaccines and the resultant social issues heightens the need for multidisciplinary learning. There will be a growing demand for humanities and art, as India moves towards becoming a developed country as well as among the three largest economies in the world. Indeed, with the quickly changing employment landscape and global ecosystem, it is becoming increasingly critical that children not only learn, but more importantly learn how to learn. Education thus, must move towards less content, and more towards learning about how to think critically and solve problems, how to be creative and multidisciplinary, and how to innovate, adapt, and absorb new material in novel and changing fields.

Pedagogy must evolve to make education more experiential, holistic, integrated, inquiry-driven, discovery-oriented, learner-centred, discussion-based, flexible, and, of course, enjoyable. The curriculum must include basic arts, crafts, humanities, games, sports and fitness, languages, literature, culture, and values, in addition to science and mathematics, to develop all aspects and capabilities of learners; and make education more well-rounded, useful, and fulfilling to the learner.

Education must build character, enable learners to be ethical, rational, compassionate, and caring, while at the same time prepare them for gainful, fulfilling employment. The gap between the current state of learning outcomes and what is required must be bridged through undertaking major reforms that bring the highest quality, equity, and integrity into the system, from early childhood care and education through higher education. The aim must be for India to have an education system by 2040 that is second to none, with equitable access to the highest-quality education for all learners regardless of social or economic background. This National Education Policy 2020 is the first education policy of the 21st century and aims to address the many growing developmental imperatives of our country. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirational goals of 21st century education, including SDG4, while building upon India's traditions and value systems. Sustainable Development (SD) encompasses an ambitious global agenda for the development of resilient, socially just human life within the limits of planet Earth. With 17 globally agreed upon goals, 169 targets and well over 200 indicators, the Sustainable Development Goals (SDGs) are currently the core normative framework for global sustainability efforts (e.g., Biermann et al., 2017; Biermann et al., 2022).

Although the SDGs are not without controversy due to their inherently conflicting goals (Hickel, 2019; Holden et al., 2017; Spangenberg, 2017), the general necessity and urgency to move toward global sustainability is virtually undisputed in academia and international

politics (e.g., Richardson et al., 2023; Rockström et al., 2023; United Nations General Assembly, 2023). As important as the SDGs are, the findings of the mid-term report on their implementation are very sobering (Sachs et al., 2023): Currently, none of the 17 goals are on track, and in some cases progress is reported to be going backwards. Nonetheless, the authors remind us that all of the goals are still achievable (ibid.). For this transition, the mid-term report highlights universal quality education as a critical SD pathway, among others. This is supported by studies on assessments of the SDGs and their interactions, in which quality education (SDG 4) and particularly SDG 4.7 are described as having a strong positive relationship with various other SDGs (Dalampira & Nastis, 2020; Fonseca et al., 2020; Pham-Truffert et al., 2020; Vladimirova & Le Blanc, 2016; Xiao et al., 2023). In this vein, linking education with sustainability has been discussed as fundamental for change toward sustainability both in the fields of education (Agbedahin, 2019; Sterling, 2003, 2016; Wals & Benavot, 2017) and sustainability research (Abson et al., 2017; Otto et al., 2020; Sachs et al., 2019; Van Poeck et al., 2020).

Correspondingly, target 4.7 of the SDGs calls for education systems worldwide to "ensure [by 2030] that all learners acquire the knowledge and skills needed to promote sustainable development" (United Nations General Assembly, 2015, p. 21). Against this backdrop, Education for Sustainable Development (ESD) is approached by UNESCO and its member states as "an enabler for all 17 SDGs" and a "foundation for the required transformation" (UNESCO, 2021). Consequently, the final declaration at the UNESCO World Conference on ESD in 2021 set a commitment for member states to "[e]nsure that ESD is a foundational element of our education systems at all levels" (UNESCO, 2021, p. 2).

To be able to meet this commitment as well as the objective set in SDG 4.7, it is of critical importance to systematically monitor and evaluate the degree to which ESD and sustainability are being integrated within education systems (Brent Edwards et al., 2020; Kioupi & Voulvoulis, 2019; Stepanek Lockhart, 2018). Such data provide the basis for observing trends, identifying progress and gaps as well as deriving necessary policy measures to strengthen the implementation of ESD. As with all SDGs, the development of concrete and facilitative indicators for the integration of sustainability in education is crucial for its governance and practical implementation (Biermann et al., 2017; Hák et al., 2016; Kim, 2023). Currently, the global indicator for target 4.7 of the SDGs is described as the "extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment" (UNESCO, 2017, 2019a, 2019b). However, this indicator has not yet been sufficiently operationalized for independent and scientific assessments (Brent Edwards et al., 2020; Giangrande et al., 2019).

Monitoring is currently based on countries' self-reporting using a dichotomous (yes/no) assessment scheme as well as qualitative highlighting of best-practice cases (UNESCO, 2019a, 2019b). This reliance on countries' self-reporting results in a bias toward positive reporting (e.g., Nazir et al., 2011), which most likely does not reflect the real status of target 4.7. Taking the example of Germany, the current score on the global indicator for SDG 4.7.1 is reported at 1.0 for national education policies (range: 0–1), 0.904 for curricula, 0.95 for teacher education and 0.917 for student assessment (Destatis, 2023). However, the results derived from independent data from the national monitoring of ESD in Germany (e.g., Grund & Brock, 2020; Holst et al., 2020) are significantly different. While there is

considerable support for the integration of ESD into the German education system, including through a large participatory multi-stakeholder process (Nationale Plattform BNE c/o BMBF, 2017; Singer-Brodowski et al., 2020), the discrepancies between self-reporting scores and evaluations by independent monitoring provide good reasons for complementing countries' self-reporting on SDG 4.7 with independent evaluations to allow for evidence-informed policy-making (Lingard, 2013).

The fundamental principles that will guide both the education system at large, as well as the individual institutions within it are:

- recognizing, identifying, and fostering the unique capabilities of each student, by sensitizing teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres;
- according the highest priority to achieving Foundational Literacy and Numeracy by all students by Grade 3;
- flexibility, so that learners have the ability to choose their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
- no hard separations between arts and sciences, between curricular and extra-curricular activities, between vocational and academic streams, etc. in order to eliminate harmful hierarchies among, and silos between different areas of learning;
- multidisciplinarity and a holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world in order to ensure the unity and integrity of all knowledge;
- emphasis on conceptual understanding rather than rote learning and learning-for-exams;
- creativity and critical thinking to encourage logical decision-making and innovation;
- ethics and human & Constitutional values like empathy, respect for others, cleanliness, courtesy, democratic spirit, spirit of service, respect for public property, scientific temper, liberty, responsibility, pluralism, equality, and justice;
- promoting multilingualism and the power of language in teaching and learning;
- life skills such as communication, cooperation, teamwork, and resilience;
- focus on regular formative assessment for learning rather than the summative assessment that encourages today's 'coaching culture ';
- extensive use of technology in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management;
- respect for diversity and respect for the local context in all curriculum, pedagogy, and policy, always keeping in mind that education is a concurrent subject;
- full equity and inclusion as the cornerstone of all educational decisions to ensure that all students are able to thrive in the education system;
- synergy in curriculum across all levels of education from early childhood care and education to school education to higher education;
- teachers and faculty as the heart of the learning process – their recruitment, continuous professional development, positive working environments and service conditions;
- a 'light but tight' regulatory framework to ensure integrity, transparency, and resource efficiency of the educational system through audit and public disclosure while encouraging innovation and out-of-the-box ideas through autonomy, good governance, and empowerment; • outstanding research as a corequisite for outstanding education and development;

- continuous review of progress based on sustained research and regular assessment by educational experts.

Conclusion

Education is viewed as a critical keystone in achieving the Sustainable Development Goals (SDGs). Specifically, Education for Sustainable Development (ESD) is meant to enable everyone to contribute to sustainable development (SDG 4.7). This target is monitored using the global indicator 4.7.1 – mainstreaming of ESD in policies, curricula, training of educators and student assessment. Here, we offer a conceptual and methodological framework for assessments of SDG 4.7.1 (input-level) that addresses both quality and depth of implementation and speed of change. The approach combines document analysis with external expert evaluation and is applied to 10-year data (>11,000 documents) from all formal areas of education in Germany (early childhood education, school education, vocational education and training, higher education). Currently, ESD is mostly implemented in Germany as an "add-on" to the educational system, with all sub-indicators ranging from "isolated mentioning" of ESD and related concepts to "partial integration". Across most areas of education, the sub-indicator training of educators was evaluated as most deficient. With regard to the speed of change, it was found that the implementation of ESD is dynamic, with all sub-indicators having been evaluated as increasing. The proposed framework can increase the validity, reliability, and comparability of both country reporting and scientific assessments of SDG 4.7.1. We argue for independent and integrative monitoring across input, process, output and outcome to complement self-reporting and to support evidence-informed policymaking on sustainability in education.

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